CLAIMS

The invention claimed is:

1. A magnetometer comprising:

a resonant sensor for sensing a magnetic field, said sensor generating an output signal having a signal characteristic that varies in response to the sensed magnetic field;

an excitation circuit coupled to said resonant sensor for supplying an excitation signal thereto, said excitation circuit limits the amplitude of the excitation signal to prevent significant saturation of the response of said resonant sensor to the excitation signal; and

a processor coupled to receive the output signal from said sensor, said processor determines the magnetic field component sensed by said sensor.

2. The magnetometer of claim 1, wherein said excitation circuit maintains a stable phase relationship between the output signal of said resonant sensor and the excitation signal which drives said resonant sensor.

3. The magnetometer of claim 1, wherein said processor measures the frequency of the output signal from said resonant sensor by timing the period of a predetermined number of cycles of the output signal.

4. The magnetometer of claim 1, wherein said resonant sensor is an inductive field sensor having a winding, and said resonant sensor is configured such that substantially all DC current supplied thereto flows through said winding.

5. The magnetometer of claim 1, wherein the output signal of said resonant sensor is supplied to a high gain amplifier.

6. The magnetometer of claim 1, wherein the output signal of said resonant sensor is supplied to a comparator.

7. The magnetometer of claim 1 and further comprising a filter for filtering the excitation signal prior to application to said resonant sensor, said filter making the excitation signal approximately sinusoidal.

8. The magnetometer of claim 7, wherein said filter is a multiple pole filter.

9. The magnetometer of claim 1 and further comprising an amplifier for driving said resonant sensor, an output of said amplifier is coupled to an input of said excitation circuit.

10. The magnetometer of claim 1, wherein said processor determines the magnetic field component sensed by said sensor by measuring a phase shift of the output signal of said sensor relative to the phase of the excitation signal.

11. The magnetometer of claim 10, wherein the excitation signal has a frequency that is approximately equal to the resonant frequency of said resonant sensor for a nominal center point for the operation of said resonant sensor.

12. The magnetometer of claim 1, wherein said processor determines the magnetic field component sensed by said sensor by measuring the frequency of the output signal of said sensor.

13. The magnetometer of claim 12, wherein the excitation signal is nominally in phase with the output signal of said resonant sensor.

14. The magnetometer of claim 13, wherein the excitation signal has a nominally constant phase with respect to the output signal of said resonant sensor.

15. The magnetometer of claim 1 and further including a biasing circuit for dynamically biasing said resonant sensor in response to a bias setting applied by said processor and said processor determines the magnetic field component sensed by said sensor as a function of the bias setting applied to said sensor.

16. An electronic compass for a vehicle comprising:

a first resonant magnetic field sensor for sensing a first component of a magnetic field;

a second resonant magnetic field sensor for sensing a second component of the magnetic field that is orthogonal to the first component, each of said sensors generating an output signal having a signal characteristic that varies in response to both the sensed component magnetic fields;

an excitation circuit coupled to said first and second resonant magnetic field sensors for supplying an excitation signal thereto, said excitation circuit limits the amplitude of the excitation signal to prevent significant saturation of the response of said resonant sensor to the excitation signal; and

a processing circuit is coupled to receive the output signals from said sensors to determine the magnetic field components sensed by said sensors, said processing circuit computes a vehicle heading as a function of the sensed magnetic field components; and

a heading indicator coupled to said processing circuit for indicating the vehicle heading.

17. A magnetometer comprising:

a resonant sensor for sensing a magnetic field, said sensor generating an output signal having a signal characteristic that varies in response to the sensed magnetic field and in response to an applied bias;

a biasing circuit for adjustably biasing said sensor at two or more bias levels; and

a processor coupled to receive the output signal from said sensor, said processor determines the magnetic field component sensed by said sensor, wherein the peak to peak excursion of the magnetic field level in said resonant sensor during a resonant cycle is a fraction of the field level excursion range due to the adjustment of the bias circuit over its total range of adjustment.

18. The magnetometer of claim 17, wherein said biasing circuit dynamically biases said sensor in response to a bias setting applied by said processor and said processor determines the magnetic field component sensed by said sensor as a function of the bias setting applied to said sensor.

19. The magnetometer of claim 17, wherein the peak to peak excursion of the magnetic field level in said resonant sensor during a resonant cycle is less than one-half of the field level excursion range due to the adjustment of the bias circuit over its total range of adjustment.

20. The magnetometer of claim 17, wherein the peak to peak excursion of the magnetic field level in said resonant sensor during a resonant cycle is less than one-fourth of the field level excursion range due to the adjustment of the bias circuit over its total range of adjustment.

21. A magnetometer comprising:

a resonant sensor for sensing a magnetic field, said sensor generating an output signal having a signal characteristic that varies in response to the sensed magnetic field; and a processor coupled to receive the output signal from said sensor, said processor determines the magnetic field component sensed by said sensor,

wherein the peak to peak excursion of the magnetic field level in said resonant sensor during a resonant cycle is less than the total range of the magnetic field to be measured.

22. The magnetometer of claim 21, wherein the peak to peak excursion of the magnetic field level in said resonant sensor during a resonant cycle is less than one-half of the total range of the magnetic field to be measured.

23. The magnetometer of claim 21 and further including a biasing circuit for dynamically biasing said resonant sensor in response to a bias setting applied by said processor and said processor determines the magnetic field component sensed by said sensor as a function of the bias setting applied to said sensor.

24. A magnetometer comprising:

a sensor for sensing a magnetic field, said sensor generating an output signal having a signal characteristic that varies in response to the sensed magnetic field and in response to an applied bias;

a biasing circuit for adjustably biasing said sensor at two or more bias levels; and

a processor coupled to receive the output signal from said sensor, said processor determines the magnetic field component sensed by said sensor as a function of the signal characteristic of the output signal from said sensor and as a function of a slope of the output signal versus bias level.